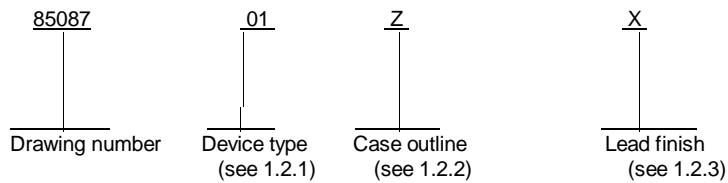


REVISIONS																					
LTR	DESCRIPTION										DATE (YR-MO-DA)				APPROVED						
A	Change to Standard Military Drawing (SMD) format. Add vendor CAGE 23223. Change the OD dimension. Add ac test circuit and waveforms.										88-03-29				W. Heckman						
B	Added vendor CAGE 27014. Correct figure 3 waveforms. Changed to reflect MIL-H-38534 processing. Editorial changes throughout.										90-09-21				W. Heckman						
C	Correct figure 3, input slew rate waveforms. Update document. Editorial changes throughout.										92-08-12				D. R. Cool						
D	Changes in accordance with NOR 5962-R228-93.										93-09-13				K. A. Cottongim						
E	Add vendor CAGE 51651. Make changes to table I. Rewrite entire document.										94-05-03				K. A. Cottongim						
<p>THE ORIGINAL FIRST PAGE OF THIS DRAWING HAS BEEN REPLACED.</p>																					
CURRENT CAGE CODE 67268																					
REV																					
SHEET																					
REV																					
SHEET																					
REV STATUS OF SHEETS				REV		E	E	E	E	E	E	E	C	C	E	E					
				SHEET		1	2	3	4	5	6	7	8	9	10						
PMIC N/A				PREPARED BY Donald R. Osborne						DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444											
STANDARDIZED MILITARY DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A				CHECKED BY William E. Shoup																MICROCIRCUIT, LINEAR, 0.2-AMP POWER OPERATIONAL AMPLIFIER, THICK FILM HYBRID	
				APPROVED BY N. A. Hauck																	
				DRAWING APPROVAL DATE 85-10-16																	
								REVISION LEVEL E						SIZE A	CAGE CODE 14933		85087				
										SHEET		1		OF		10					

1. SCOPE

1.1 Scope. This drawing describes device requirements for class H hybrid microcircuits to be processed in accordance with MIL-H-38534.

1.2 Part or Identifying Number (PIN). The complete PIN shall be as shown in the following example:



1.2.1 Device type(s). The device type(s) shall identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	0041	High-power operational amplifier, externally compensated (0.2 ampere output)

1.2.2 Case outline(s). The case outline(s) shall be as designated in MIL-STD-1835 and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
Z	See figure 1	12	Can

1.2.3 Lead finish. The lead finish shall be as specified in MIL-H-38534. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings.

Supply voltage ($\pm V_S$)	± 18 V dc
Input voltage	± 15 V dc <u>1/</u>
Power dissipation (P_D)	1.5 W <u>2/</u>
Differential input voltage	± 30 V dc
Peak output current	0.5 A <u>3/</u>
Output short circuit duration	Continuous <u>4/</u>
Storage temperature range	-65° C to +150° C
Lead temperature (soldering, 10 seconds)	+300° C
Thermal resistance:	
Junction-to-case (θ_{JC})	70° C/W
Junction-to-ambient (θ_{JA})	100° C/W
Junction temperature (T_J)	+150° C

1.4 Recommended operating conditions.

Ambient operating temperature range (T_A)	-55° C to +125° C
---	-------------------

1/ Rating applies for supply voltages above ± 15 V. For supplies less than ± 15 V, rating is equal to the supply voltage.

2/ Rating applies at $T_A = +25^\circ\text{C}$, without heat sink.

3/ Rating applies for $R_{SC} = 0$ ohms.

4/ Rating applies as long as package power rating is not exceeded.

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2. APPLICABLE DOCUMENTS

2.1 Government specification and standards. Unless otherwise specified, the following specification and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-H-38534 - Hybrid Microcircuits, General Specification for.

STANDARDS

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

MIL-STD-1835 - Microcircuit Case Outlines.

(Copies of the specification and standards required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with MIL-H-38534 and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-H-38534 and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein and on figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.2.3 Test circuit and waveforms. The test circuit and waveforms shall be as specified on figure 3.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

3.5 Marking. Marking shall be in accordance with MIL-H-38534. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked as listed in QML-38534 (see 6.6 herein).

3.6 Manufacturer eligibility. In addition to the general requirements of MIL-H-38534, the manufacturer of the part described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, produced on the certified line, for each device type listed herein. The data should also include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DESC-EC) upon request.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/</u> $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input offset voltage	V_{IO}	$R_S \leq 100\Omega$ <u>2/</u>	<u>1</u>	01		3	mV
			2,3			5	
Input offset current	I_{IO}	<u>2/</u>	<u>1</u>	01		100	nA
			2,3			300	
Input bias current	I_{IB}	<u>2/</u>	<u>1</u>	01		300	nA
			2,3			1	μA
Input resistance <u>3/</u>	R_{IN}	$T_A = +25^{\circ}\text{C}$	1	01	0.3		M Ω
Common mode rejection ratio	CMRR	$R_S \leq 100\Omega$, $V_{CM} = \pm 10\text{ V}$	1,2,3	01	70		dB
		$R_S \leq 100\Omega$, $V_{CM} = \pm 10\text{ V}$ $f_{IN} = 10\text{ Hz}$ (for vendor CAGE code 51651 only)	4,5,6	01	70		
Input voltage range <u>3/</u>	V_{CM}		1,2,3	01	± 12		V
Power supply rejection ratio	PSRR	$R_S \leq 100\Omega$ $V_S = \pm 5\text{ V to } \pm 15\text{ V}$	1,2,3	01	80		dB
Voltage gain <u>4/</u>	A_V	$V_O = \pm 10\text{ V}$, $R_L = 1\text{ k}\Omega$, $T_A = +25^{\circ}\text{C}$	1	01	100		V/mV
		$V_O = \pm 10\text{ V}$, $R_L = 100\Omega$	1,2,3	01	25		
		$V_O = \pm 10\text{ V}$, $R_L = 1\text{ k}\Omega$, $f_{IN} = 10\text{ Hz}$, $T_A = +25^{\circ}\text{C}$ (for vendor CAGE code 51651 only)	4	01	100		
		$V_O = \pm 10\text{ V}$, $R_L = 100\Omega$ $f_{IN} = 10\text{ Hz}$, (for vendor CAGE code 51651 only)	4,5,6	01	25		
Output voltage swing	V_O	$R_L = 100\Omega$	1,2,3	01	± 13		V
Output short circuit current	I_{SC}	$T_A = +25^{\circ}\text{C}$, $R_{SC} = 3.3\Omega$	1	01	-300	+300	mA

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1/</u> $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Supply current	I_{CC}	$V_{OUT} = 0\text{ V}$	1,2,3	01		3.5	mA
Power consumption <u>3/</u>	P_C	$V_{OUT} = 0\text{ V}$	1,2,3	01		105	mW
Slew rate	SR	$A_V = 1, R_L = 100\Omega,$	4	01	1.5		V/ μs
Small signal rise time	t_r	$T_A = +25^{\circ}\text{C}$, see figure 3	9	01		1	μs
Small signal fall time	t_f	$T_A = +25^{\circ}\text{C}$, see figure 3	9	01		1	μs
Small signal overshoot		$T_A = +25^{\circ}\text{C}$, see figure 3	4	01		20	%

1/ Unless otherwise specified, $\pm V_S = \pm 15\text{ V}$, $C_C = 3000\text{ pF}$.

2/ Specifications apply for $\pm 5\text{ V} \leq \pm V_S \leq \pm 18\text{ V}$.

3/ Parameter shall be guaranteed to the limits specified in table I for all lots not specifically tested.

4/ The amplifier has a "dead band" when V_{OUT} is near zero volts. Typical values for the "dead band" are in the 50 to 200 μV range. Open-loop gain is measured at V_{OUT} from $\pm 0.5\text{ V}$ dc to $\pm 10\text{ V}$ dc which is out of the range of the "dead band".

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in QML-38534 (see 6.6 herein). The certificate of compliance submitted to DESC-EC prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-H-38534 and the requirements herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-H-38534 shall be provided with each lot of microcircuits delivered to this drawing.

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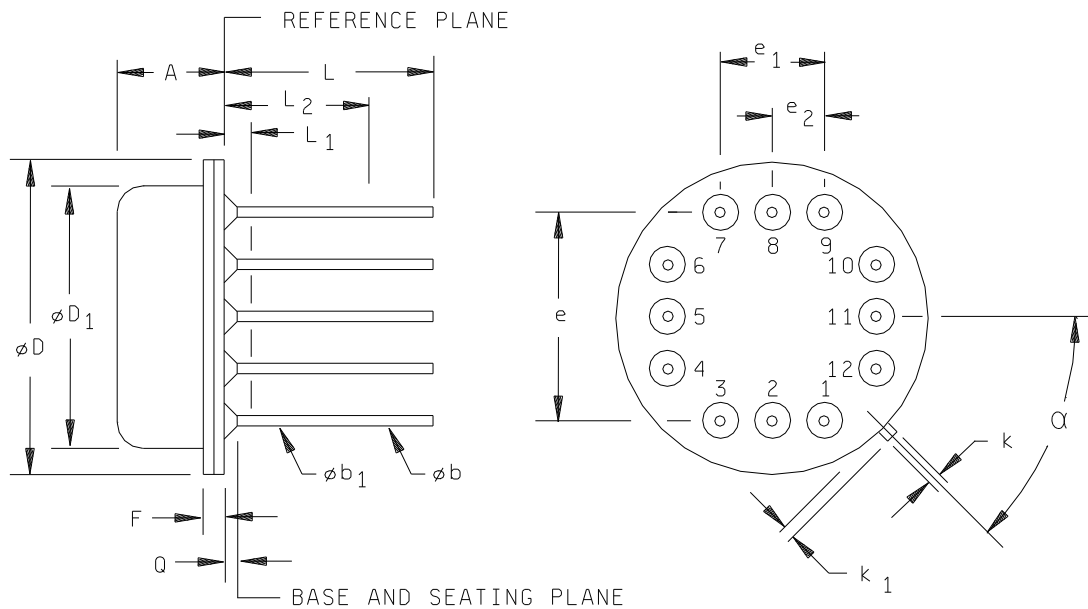
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Case outline Z



Dimensions									
Symbol	Inches		Millimeters		Notes	Symbol	Inches		Notes
	Min	Max	Min	Max			Min	Max	
A	.130	.181	3.30	4.60		F	.022	.030	
ϕb	.016	.019	0.41	0.48	1,5	k	.026	.036	
ϕb_1	.016	.021	0.41	0.53	1,5	k_1	.026	.036	2
ϕD	.595	.610	15.11	15.37		L	.500	.560	1
ϕD_1	.545	.555	13.84	14.10		L_1	---	.050	1
e	.400 BSC		10.16 BSC		3	L_2	.250	---	1
e_1	.200 BSC		5.08 BSC		3	Q	---	.045	1
e_2	.100 BSC		2.54 BSC		3	α	45° BSC	45° BSC	3

NOTES:

1. (All leads) ϕb applies between L_1 and L_2 . ϕb_1 applies between L_2 and .500 (12.70 mm) from the reference plane. Diameter is uncontrolled in L_1 and beyond .500 (12.70 mm) from the reference plane.
2. Measured from the maximum diameter of the product.
3. Leads having a maximum diameter .019 (0.48 mm) measured in gauging plane .054 (1.37 mm) +.001 (0.03 mm), -.000 (0.00 mm) below the base plane of the product shall be within .007 (0.18 mm) of their true position relative to a maximum width tab.
4. The product may be measured by direct methods or by gauge.
5. All leads - increase maximum limit by .003 (0.08 mm) when lead finish A or B is applied.

FIGURE 1. Case outline(s) - Continued.

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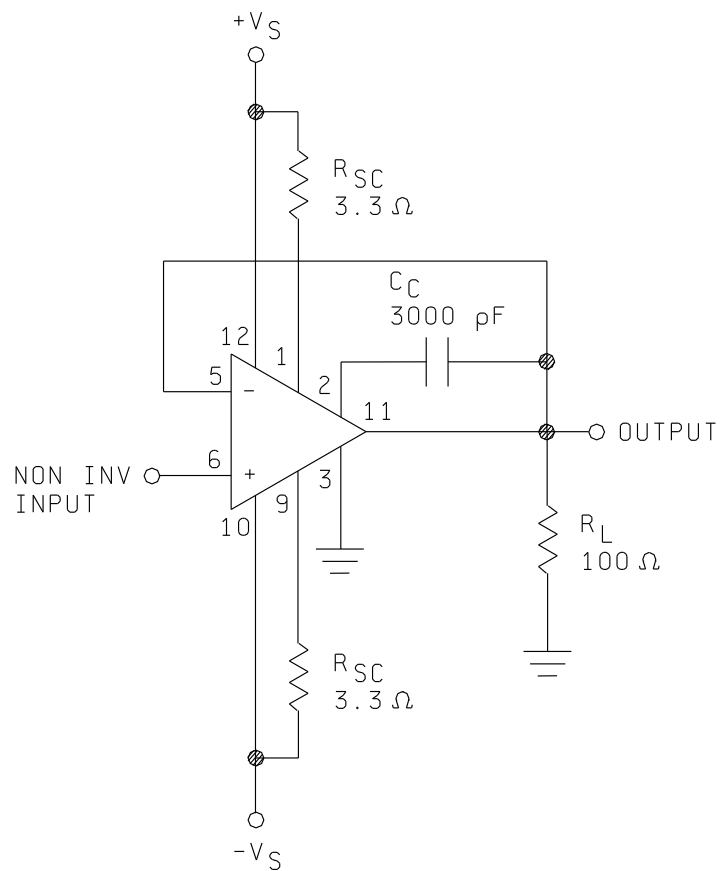
Device type	01
Case outline	Z
Terminal number	Terminal symbol
1	I_{SC}^{+}
2	Compensation
3	Ground
4	NC
5	$-V_{IN}$
6	$+V_{IN}$
7	Offset null
8	Offset null
9	I_{SC}^{-}
10	$-V_S$
11	Output
12	$+V_S$

NOTES:

1. C_C is connected between pins 2 and 11.
2. Case is electrically isolated.

FIGURE 2. Terminal connections.

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NOTE: $\pm V_S = \pm 15 \text{ V}$

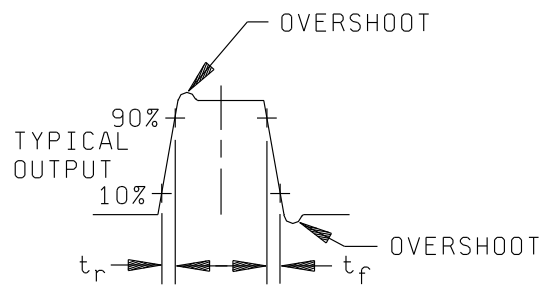
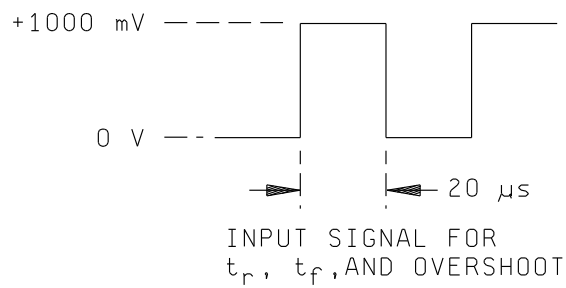
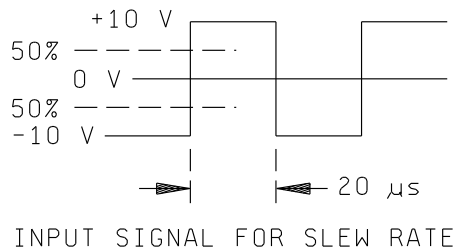


FIGURE 3. Test circuit and waveforms.

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TABLE II. Electrical test requirements.

MIL-H-38534 test requirements	Subgroups (in accordance with MIL-H-38534, group A test table)
Interim electrical parameters	
Final electrical test parameters	1*,2,3,4,9
Group A test requirements	1,2,3,4,9
Group C end-point electrical parameters	1,2,3

* PDA applies to subgroup 1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-H-38534.

4.2 Screening. Screening shall be in accordance with MIL-H-38534. The following additional criteria shall apply:

a. Preseal burn-in test, method 1030 of MIL-STD-883.

- (1) Test condition C or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DESC-EC or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1030 of MIL-STD-883.
- (2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

b. Burn-in test, method 1015 of MIL-STD-883.

- (1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DESC-EC or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.
- (2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

c. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

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4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-H-38534 and as specified herein.

4.3.1 Group A inspection. Group A inspection shall be in accordance with MIL-H-38534 and as follows:

- a. Tests shall be as specified in table II herein.
- b. Subgroups 5, 6, 7, 8, 10, and 11 shall be omitted.

4.3.2 Group B inspection. Group B inspection shall be in accordance with MIL-H-38534.

4.3.3 Group C inspection. Group C inspection shall be in accordance with MIL-H-38534 and as follows:

- a. End-point electrical parameters shall be as specified in table II herein.
- b. Steady-state life test, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DESC-EC or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005.

(2) T_A as specified in accordance with table I of method 1005 of MIL-STD-883.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection. Group D inspection shall be in accordance with MIL-H-38534.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-H-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-973 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444, or telephone (513) 296-5373.

6.6 Approved sources of supply. Approved sources of supply are listed in QML-38534. Additional sources will be added to QML-38534 as they become available. The vendors listed in QML-38534 have agreed to this drawing and a certificate of compliance (see 3.7 herein) has been submitted to and accepted by DESC-EC.

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